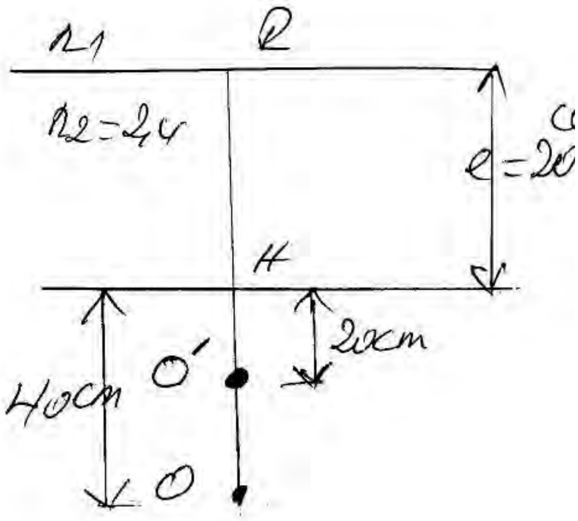
1/ $O \xrightarrow{H} O' \xrightarrow{R} O''$

$\quad n_1 \qquad n_2 \qquad n_1$

$\frac{HO}{n_1} = \frac{HO'}{n_2} \rightarrow n_1 = \frac{HO}{HO'} \cdot n_2$

$n_1 = \frac{40}{20}\, 2{,}4 \rightarrow n_1 = 4{,}8$

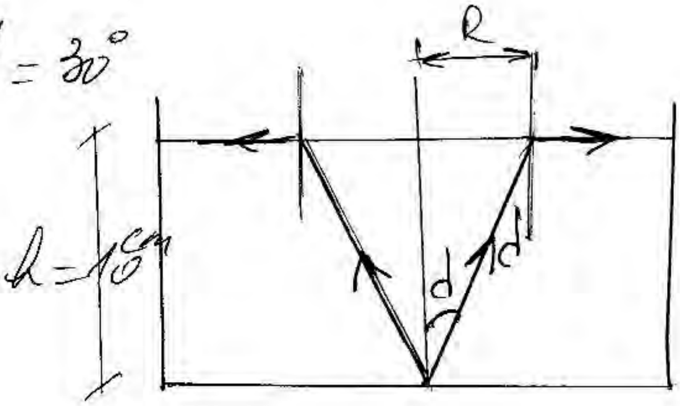


2/ $\operatorname{tg} d = \frac{R}{h} \rightarrow R = h \operatorname{tg} d$

$\sin d = \frac{n_0}{2} \quad \sin d = \frac{1}{2} \rightarrow d = 30°$

$R = 10 \times \operatorname{tg} 30°$

$R = 5{,}77 \text{ cm}$



3/ $i = 90° \rightarrow r = d$

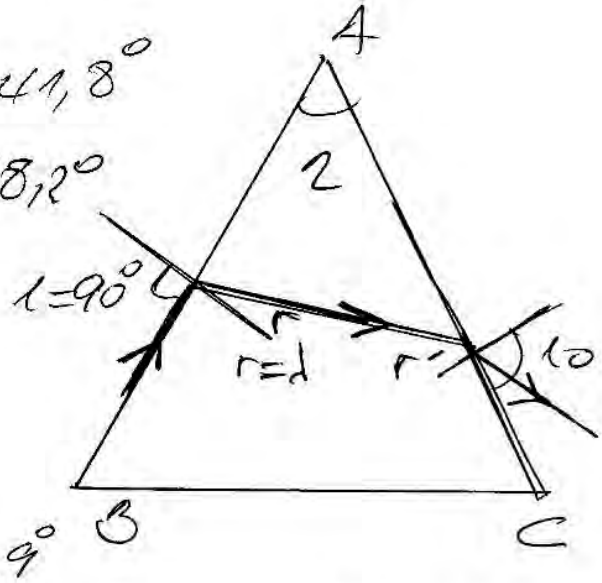
$\sin d = \frac{1}{n} \quad \sin d = \frac{1}{1{,}5} \rightarrow d = 41{,}8°$

$A = r + r' \rightarrow r' = A - d \quad r' = 18{,}2°$

$n \sin r' = n_0 \sin i_0$

$\sin i_0 = \frac{n \sin r'}{n_0}$

$\sin i_0 = \frac{1{,}5}{1} \sin 18{,}2 \quad i_0 = 27{,}9°$



ou bien directement puisque $i = 90°$ donc $i' = i_0$ avec

$n_0 \sin i_0 = n \sin(A - d)$

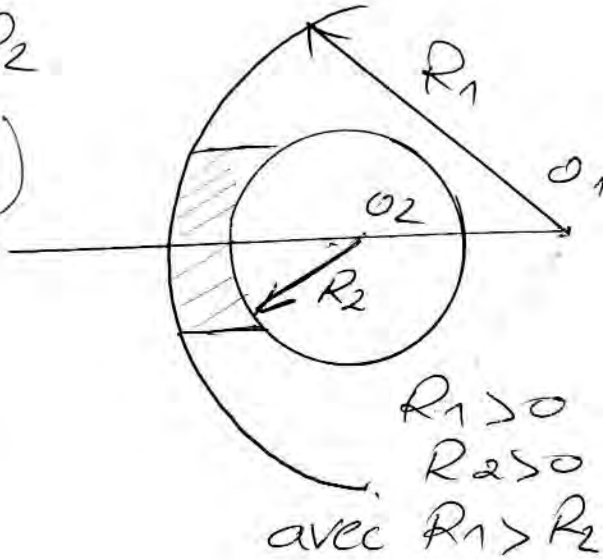
$\sin i_0 = \frac{n}{n_0} \sin(A - d)$

$\sin i_0 = \frac{1{,}5}{1} \sin(60 - 41{,}8°) \rightarrow i_0 = 41{,}9°$

1

4/ Puisque le rayon a pénétré le prisme, il se trouve dans le milieu le moins réfringent donc il émergera → d

5/ $R_1 > 0$ $R_2 > 0$ avec $R_1 > R_2$



$$C = \frac{1}{OF'} = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$OF' = -40\,cm$ (Lentille DV)

$$-\frac{1}{40} = \left(\frac{1{,}5}{1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{10}\right)$$

$R_1 = 20\,cm$

6/ $OV \rightarrow OA > 0$
$I.V \rightarrow OA' < 0$ $\Big\} \rightarrow \gamma < 0$

2 fois plus grande $\Rightarrow |A'B'| = 2|AB|$

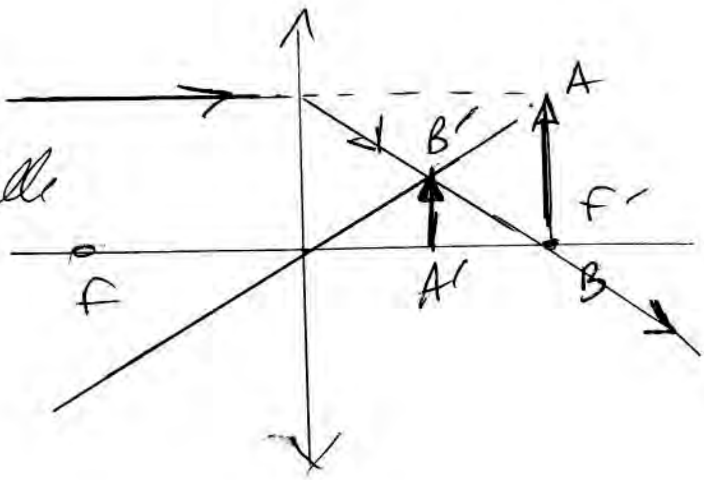
$\rightarrow \frac{|A'B'|}{|AB|} = 2 \rightarrow |\gamma| = 2 \rightarrow \gamma = -2$

$\gamma = \frac{OA'}{OA}$ $OA = 12\,cm \rightarrow OA' = -24\,cm$.

$$\frac{1}{OF'} = \frac{1}{OA'} - \frac{1}{OA} \quad \frac{1}{OF'} = \frac{1}{-24} - \frac{1}{12} \rightarrow OF' = -8\,cm$$

7/

A'B' image réelle
→ d



2

8/ $A = 4\delta$ oeil normal $OPR \equiv -\infty$

$A = \cancel{\frac{1}{OPR}} - \frac{1}{OPP} \rightarrow OPP = -\frac{1}{OA} \rightarrow OPP = -0{,}25\,m$

9/ $C_{max} = \frac{1}{OT} - \frac{1}{OPP}$ (avec $OT = 17\,mm$)

$\frac{1}{OPP} = \frac{1}{OT} - C_{max}$ $\quad \frac{1}{OPP} = \frac{1}{17 \times 10^{-3}} - 64{,}7 \rightarrow OPP = -17\,cm$

10/ $C = 1\,\delta$ $\quad OPR_c \equiv -\infty$

$C = \cancel{\frac{1}{OPR}} - \frac{1}{OPP}$ $\quad$ ~~$OPP = -\frac{1}{C}$~~ $\rightarrow OPP =$

$C = \frac{1}{OPR} - \frac{1}{OPR_c}$ $\quad OPR = \frac{1}{C} \rightarrow OPR = +1\,m$

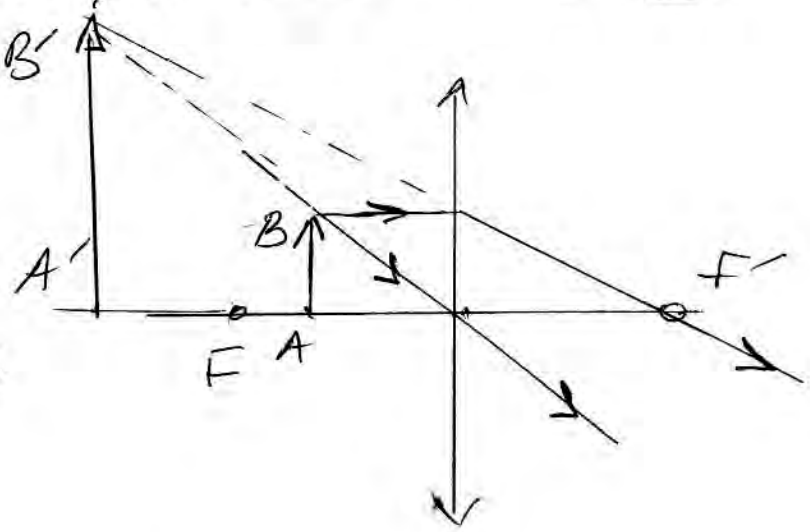
11/ $A = 1\,\delta$ la presbytie n'affecte pas le PR $\rightarrow$ OPR ne change pas. $\rightarrow$ ©

12/ le PP s'éloigne, A varie $\rightarrow$ (a)

13/

Il s'agit d'une loupe

$A'B'$ = Image virtuelle $\rightarrow$ (a)



14/ $i = 60°$

$\sin d = \frac{n_1}{n_2}$ $\quad \sin d = \frac{1{,}5}{3{,}5}$ $\quad d = 25{,}37°$

$i = 60° > d = 25{,}37 \rightarrow$ réflexion totale

$\rightarrow$ ©

3

15/ $A = 2\delta$ $A = \frac{1}{\overline{OPR}} - \frac{1}{\overline{OPP}}$ $\overline{OPP} = -25\,cm$

$\rightarrow \overline{OPR} = -0{,}5\,m \longrightarrow$ myope

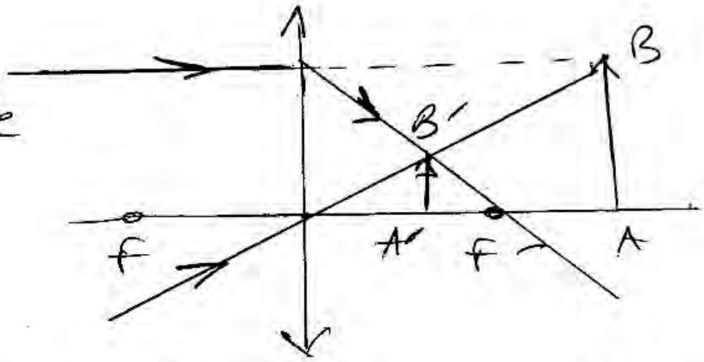
16/ $\Rightarrow$ CV à bords minces $\longrightarrow$ (c)

17/ ne subit aucune déviation $\longrightarrow$ (b)

18/ voir page

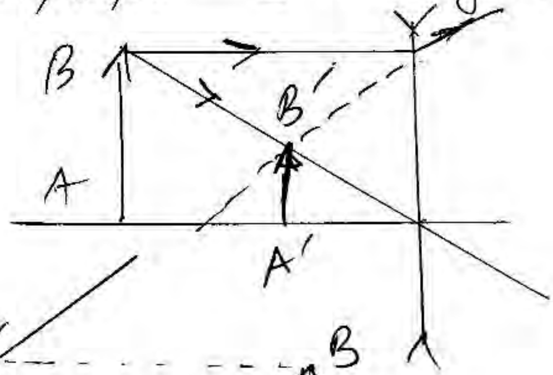
19/ A'B' image réelle droite

$\longrightarrow$ (b)



20/ lentille qui corrige la myope $\longrightarrow$ divergente

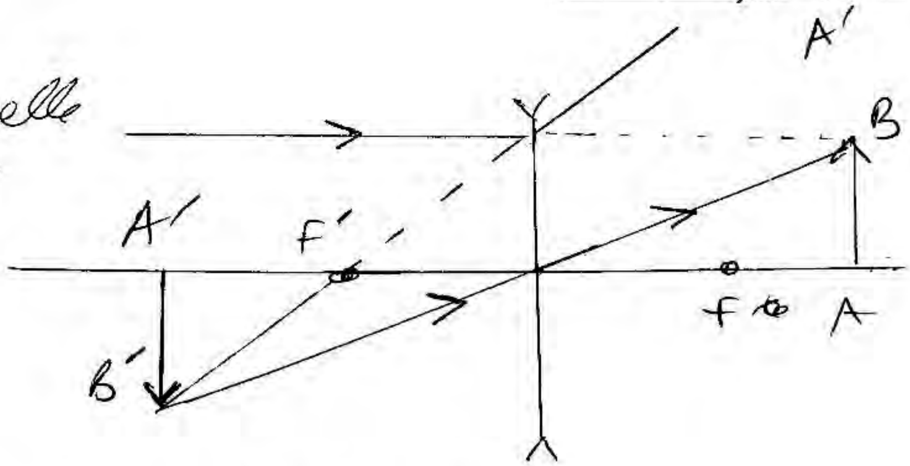
A'B' est virtuelle et droite. $\longrightarrow$ (a)



21/

Image virtuelle et inversée

$\longrightarrow$ (c)



22/ $C = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

il faut changer le milieu tel que l'indice n_0 du milieu soit supérieur à celui de la lentille n.

23/ oeil emmétrope $OPR = -\infty$ $OPP = -25\ cm$

oeil sur $F'_2 \rightarrow a = 0$ $O_1A = -1{,}5\ cm$

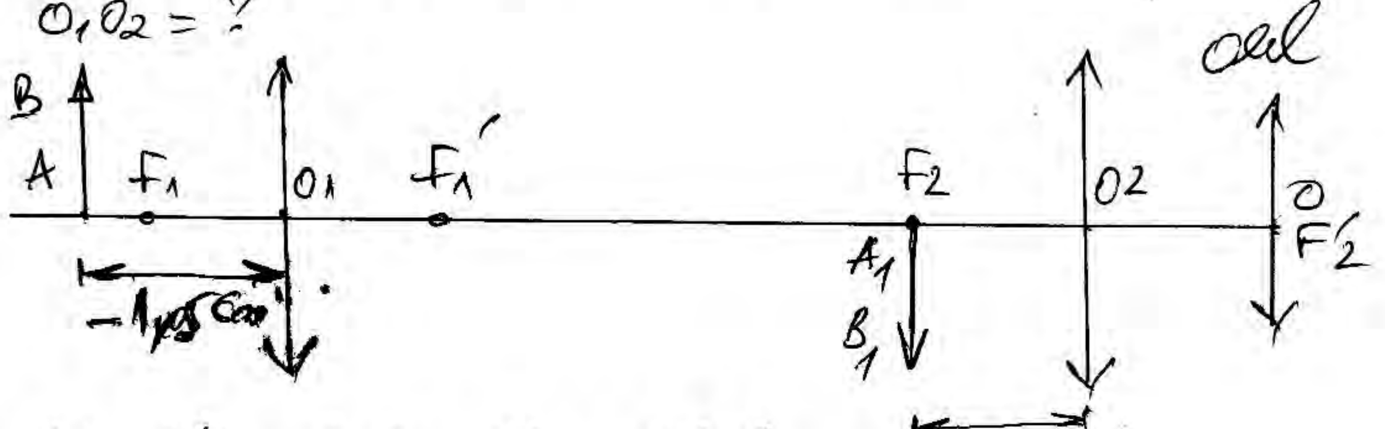
Sans accommodation $\rightarrow$ $A''B''$ à l'infini

$O_2F'_2 = 4\ cm$. $G_C = 120$

$|A_1B_1| = 4|AB| \rightarrow \frac{|A_1B_1|}{|AB|} = 4 \rightarrow |\gamma_1| = 4$

pour le microscope $\rightarrow \gamma_1 = -4$

$O_1O_2 = ?$



$AB \xrightarrow{obj} A_1B_1 \xrightarrow{oc} A'B'$
$(-\infty)$

Comme $A'B'$ est à l'infini, donc A_1B_1 est sur F_2

$AB \longrightarrow A_1B$

$A \xrightarrow[O_1F'_1]{O_1} A_1$ $\gamma_1 = \frac{O_1A_1}{O_1A} \rightarrow O_1A_1 = \gamma_1 . O_1A$

$O_1A_1 = (-4)(-1{,}5) \rightarrow O_1A_1 = 6\ cm$

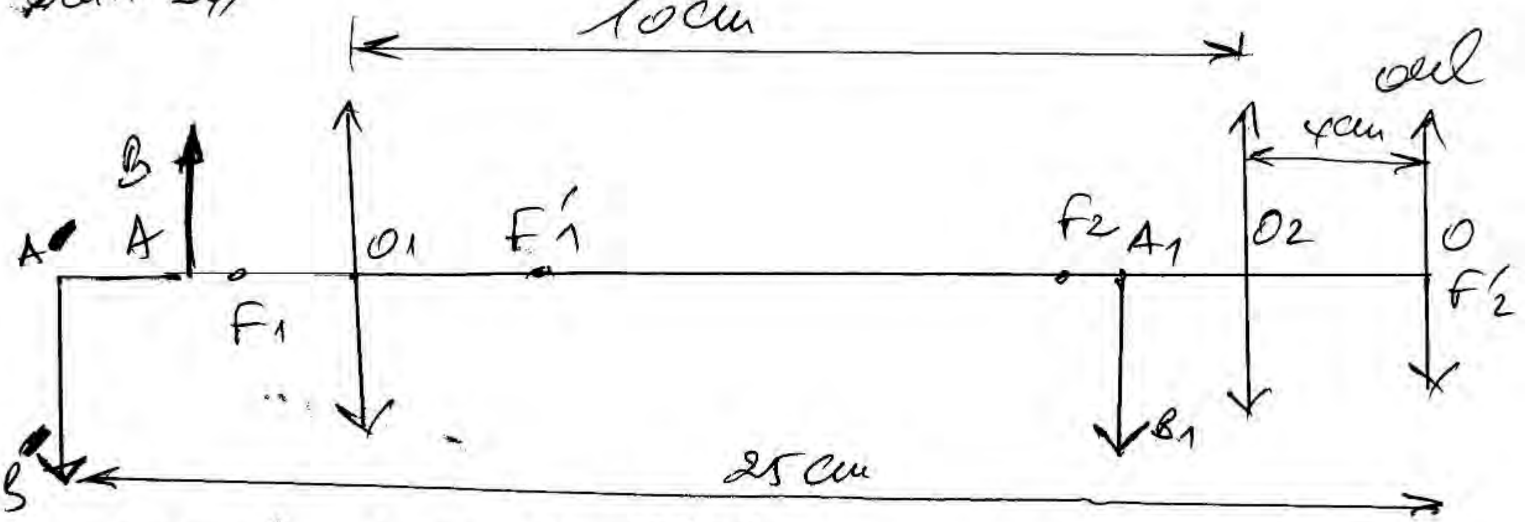
$O_1O_2 = O_1A_1 + |O_2F_2|$

$O_1O_2 = 6 + 4 \longrightarrow O_1O_2 = 10\ cm.$

24/ oeil accommode au maximum, donc l'image $A'B'$ est au PP à 25 cm de l'oeil

5

Suite 24/



$AB \xrightarrow{ob} A_1B_1 \xrightarrow{oc} A'B'$

(œil)

$(-25cm)$

$A_1B_1 \longrightarrow A'B'$

$A_1 \xrightarrow[O_2F'_2]{O_2} A' \qquad \frac{1}{O_2A'} - \frac{1}{O_2A_1} = \frac{1}{O_2F'_2}$

$\frac{1}{O_2A_1} = \frac{1}{O_2A'} - \frac{1}{O_2F'_2} \qquad \frac{1}{O_2A_1} = \frac{1}{-21} - \frac{1}{4} \qquad O_2A' = -3{,}36\ cm$

$AB \longrightarrow A_1B_1$

$A \xrightarrow[O_1F'_1]{O_1} A_1 \qquad \frac{1}{O_1A_1} - \frac{1}{O_1A} = \frac{1}{O_1F'_1} \qquad O_1A_1 = 10 - 3{,}36$

$O_1A_1 = 6{,}64\ cm$

$\frac{1}{O_1A} = \frac{1}{O_1A_1} - \frac{1}{O_1F'_1} \longrightarrow \frac{1}{O_1A} = \frac{1}{6{,}64} - \frac{1}{O_1F'_1}$

Calcul de $O_1F'_1$

$\cancel{G_c = \frac{\Delta C_{ob} \cdot C_{oc}}{4}} \longrightarrow \cancel{C_{ob} = \frac{4G_c}{\Delta}}$

dans la question 23 on a $O_1A_1 = 6cm$ $O_1A = -1{,}5\ cm$

$\frac{1}{O_1F'_1} = \frac{1}{O_1A_1} - \frac{1}{O_1A} \longrightarrow \frac{1}{O_1F'_1} = \frac{1}{6} - \frac{1}{-1{,}5} \qquad O_1F'_1 = 1{,}2cm$

$\frac{1}{O_1A} = \frac{1}{6{,}64} - \frac{1}{1{,}2} \longrightarrow O_1A = -1{,}4644\ cm$

25/ $\ell = |0,A|_{PR} - |0,A|_{RR}$

$\ell = |-1,5| - |-1,4647|$

$\ell = 0,0353$ cm

26/ $OPR = +1$ m $A = 4\,\delta$

$A = \frac{1}{OPR} - \frac{1}{OPP} \longrightarrow OPP = -33$ cm

donc 33 cm en avant de l'oeil

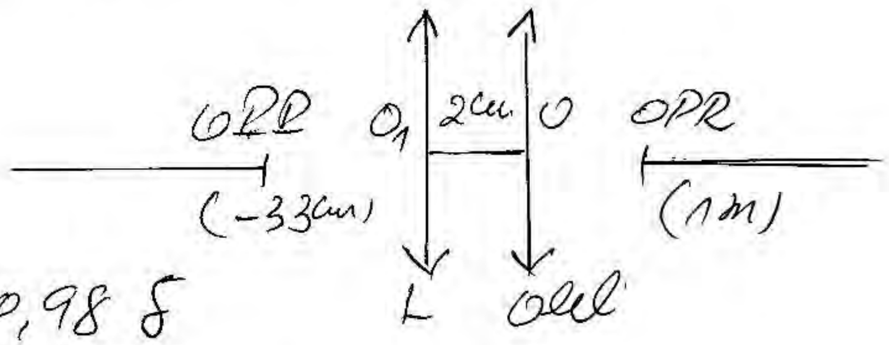
27/ $C = \frac{1}{OPR} - \frac{1}{OPR_C}$ $OPR_C = -\infty$

$C = \frac{1}{OPR}$ $OPR = \frac{1}{C}$ $C = 1\,\delta$

$C = \frac{1}{OPP} - \frac{1}{OPP_C} \longrightarrow OPP_C = -25$ cm

champ corrigé $]-\infty, -25\text{ cm}]$

28/



$C = \frac{1}{O_1PR} - \frac{1}{O_1PR_C}$

$C = \frac{1}{102\,10^{-2}}$ $C = 0,98\,\delta$

$C = \frac{1}{O_1PP} - \frac{1}{O_1PP_C} \longrightarrow \frac{1}{O_1PP_C} = \frac{1}{O_1PP} - C$

$\frac{1}{O_1PP_C} = \frac{1}{-0,31} - 0,98 \longrightarrow O_1PP_C = -0,24$ m

29/ AB réelle et A'B' réelle donc lentille CV $OF' = 4$ cm

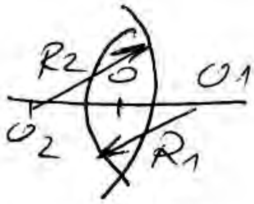
$OA' = +20$ cm

$\frac{1}{OF'} = \frac{1}{OA'} - \frac{1}{OA} \longrightarrow OA = -5$ cm

$\gamma = \frac{OA'}{OA}$ $\gamma = \frac{20}{-5}$ $\gamma = -4$ $|A'B'| = |\gamma|\,|AB|$

$\longrightarrow |A'B'| = 8$ cm

29/ $C = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ $R_1 = -R_2$ $C = \frac{1}{OF'}$



$\frac{1}{OF'} = \left(\frac{n}{n_0} - 1\right)\left(\frac{2}{R_1}\right)$

$\rightarrow n = 2,5 \rightarrow$ C

$R_1 > 0$
$R_2 < 0$
$R_1 = -R_2$

30/ $|AB| = 0,2$ mm $A'B'$ à l'infini donc AB est sur F $\rightarrow OA = -4$ cm. (car $OF = 4$ cm)

31/ $P = C\left(1 - \frac{a}{d}\right)$ $d \equiv \infty$ $P = C = \frac{1}{0,04}$ $P = 25\,\delta$

32/ $G_C = \frac{P}{4}$ $G_C = \frac{25}{4} \rightarrow G_C = 6,25$

33/ objet virtuel $\rightarrow OA > 0$
Image réelle $\rightarrow OA' > 0$ $\Big\} \rightarrow \gamma > 0$

$|A'B'| = 2|AB| \rightarrow |\gamma| = 2 \rightarrow \gamma = +2$

$\gamma = \frac{OA'}{OA}$ $OA' = 2.OA$

$\frac{1}{OA'} - \frac{1}{OA} = \frac{1}{OF'} \rightarrow \frac{1}{2(OA)} - \frac{1}{OA} = \frac{1}{OF'}$

$OF' = -2(OA)$

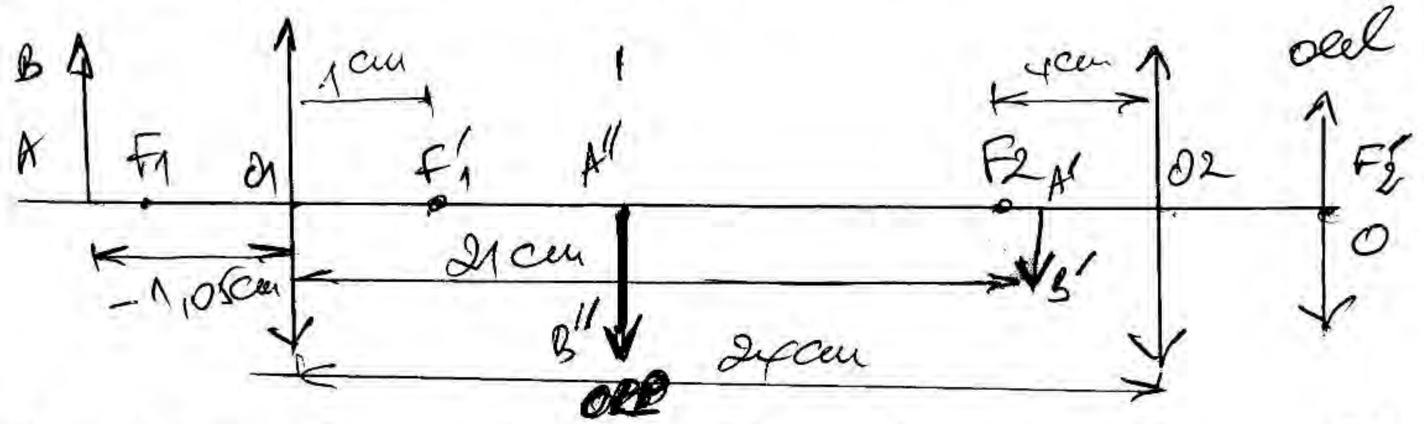
34/ objet réel $\rightarrow OA < 0$
Image réelle $\rightarrow OA' > 0$ $\Big\} \rightarrow \gamma < 0$

$|A'B'| = |AB| \rightarrow |\gamma| = 1 \rightarrow \gamma = -1$

$\frac{1}{OF'} = \frac{1}{OA'} - \frac{1}{OA}$ $OA' = -OA$

$\frac{1}{OF'} = \frac{1}{-OA} - \frac{1}{OA} \rightarrow OF' = -\frac{OA}{2}$

35/ oeil normal → oPR = −∞



$P = |\gamma ob| . P_{oc}$ $\gamma ob = \frac{O_1A'}{O_1A}$ $P_{oc} = C_{oc}\left[1 - \frac{a}{d}\right]$

$a = 0 \rightarrow P_{oc} = C_{oc}$ $P_{oc} = \frac{1}{O_2F'_2}$ $P_{oc} = \frac{1}{0,04}$

$P_{oc} = 25\ \delta$

$AB \xrightarrow{obj} A'B' \xrightarrow{oc} A''B''$

$AB \xrightarrow{obj} A'B'$

$A \xrightarrow[O_1F'_1]{O1} A'$ $\frac{1}{O_1A'} - \frac{1}{O_1A} = \frac{1}{O_1F'_1}$

$\frac{1}{O_1A'} - \frac{1}{-1,05} = \frac{1}{1} \rightarrow O_1A' = +21\ cm.$

$\gamma_1 = \frac{O_1A'}{O_1A}$ $\gamma_1 = \frac{21}{-1,05}$ $\gamma_1 = -20$

$P = |\gamma ob| . P_{oc}$ $P = |-20| . 25$ $P = 500\ \delta$

36/ $G = P \times |oRR|$

$G = 500 \times |oRR|$

on cherche oRR

$A'B' \xrightarrow{oc} A''B''$

$A' \xrightarrow[O_2F'_2]{O2} A''$ $\frac{1}{O_2A''} - \frac{1}{O_2A'} = \frac{1}{O_2F'_2}$

$\frac{1}{O_2A''} - \frac{1}{-3} = \frac{1}{4} \rightarrow O_2A'' = -12\ cm$

Suite 36

$|OA''| = 12+4$ $A'' = 16$ cm

$OPP = -16$ cm

$G = P \times |oPP|$ $G = 500 \times |0{,}16|$ $G = 80$

37/ $P = \dfrac{|\alpha''|}{|AB|}$ $P = \dfrac{\varepsilon}{|AB|_{min}}$

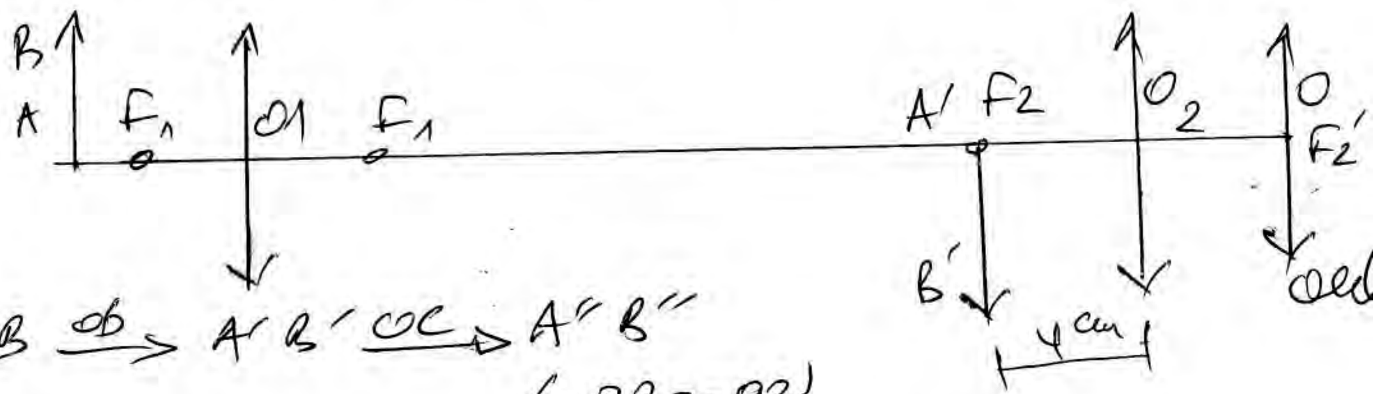
$|AB|_{min} = \dfrac{\varepsilon}{P}$ $|AB|_{min} = \dfrac{0{,}0003}{500}$ $|AB|_{min} = 6\,10^{-7}$

$|AB|_{min} = 0{,}6\mu$

38/ $LL = |O_1A|_{PR} - |O_1A|_{PP}$

$|O_1A|_{PP} = 1{,}05$ cm

on cherche $|O_1A|_{PR}$ car la position de l'objet tel que l'image $A''B''$ soit au PR



$AB \xrightarrow{ob} A'B' \xrightarrow{oc} A''B''$

$(oPR = -\infty)$

$A''B''$ à l'infini $\rightarrow A'B'$ sur F_2

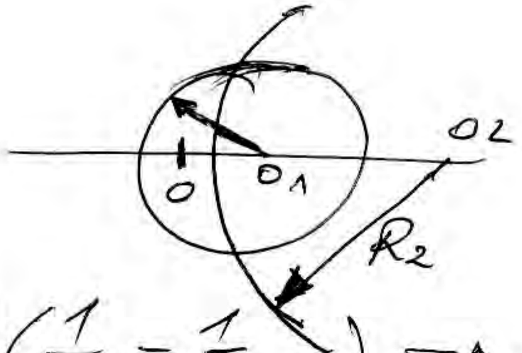
$AB \xrightarrow{ob} A'B'$

$A \xrightarrow[O_1F_1]{O_1} A'$ $\dfrac{1}{O_1A'} - \dfrac{1}{O_1A} = \dfrac{1}{O_1F_1'}$

$\dfrac{1}{O_1A} = \dfrac{1}{O_1A'} - \dfrac{1}{O_1F_1'} \rightarrow \dfrac{1}{O_1A} = \dfrac{1}{20} - \dfrac{1}{1}$ $O_1A = -1{,}05$

$LL = |-1{,}0526| - |-1{,}05|$ $LL = 0{,}0026$ cm

Exo 18/



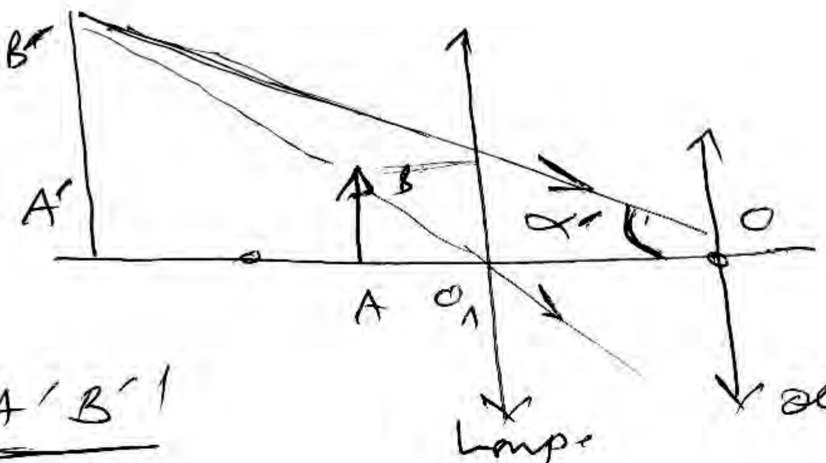
$R_1 > 0$

$R_2 > 0$

avec $R_2 > R_1$

$$C = \left(\frac{1,2}{1,6} - 1\right)\left(\frac{1}{0,3} - \frac{1}{0,45}\right) \Rightarrow \begin{cases} R_1 = 0,3\ m \\ R_2 = 0,45\ m \end{cases}$$

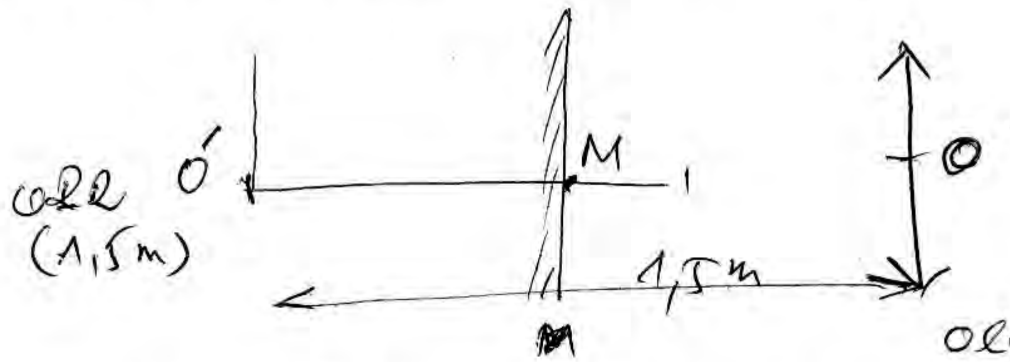
39/



$$\alpha' = \frac{|A'B'|}{OA'}$$

augmenter α' il faut diminuer OA' donc l'observateur doit se rapprocher.

46/



pour voir son image sans accommodation, cette dernière doit se situer sur le PR et on sait que O et O' sont symétriques / au miroir : $|MO'| = |MO|$

$\Rightarrow |2MO| = 1,5\ m \rightarrow MO = 75\ cm$

11

40/ $P = c\left[1 - \frac{a}{\alpha}\right]$ $a = 0$ $P = c$

donc la puissance est égale à c quelle que soit la position de l'objet

41/ $]OPR_c, OPR] =]-\infty, -20\ cm]$

$C = -2,5$ $C < 0 \rightarrow$ myope

42/ $C = \frac{1}{OPR} - \underbrace{\frac{1}{OPR_c}}_{0}$ $OPR = \frac{1}{C}$

$OPR = -0,4\,m.$

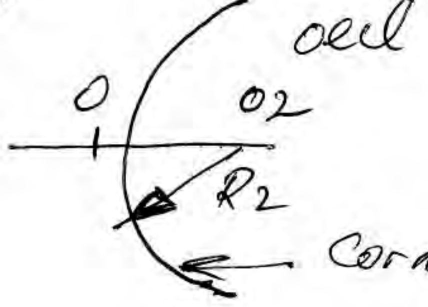
43/ $C = \frac{1}{OPR} - \frac{1}{OPP_c} \rightarrow \frac{1}{OPP_c} = C + \frac{1}{OPP}$

$\frac{1}{OPP} = -2,5 + \frac{1}{-0,2} \longrightarrow OPP = -0,133\ m$

44/ $A = \frac{1}{OPR} - \frac{1}{OPP}$ ou bien $A = \frac{1}{OPR_c} - \frac{1}{OPP_c}$

$A = \frac{1}{-0,4} - \frac{1}{-0,133}$ $A = 5\delta$

45/



$C = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

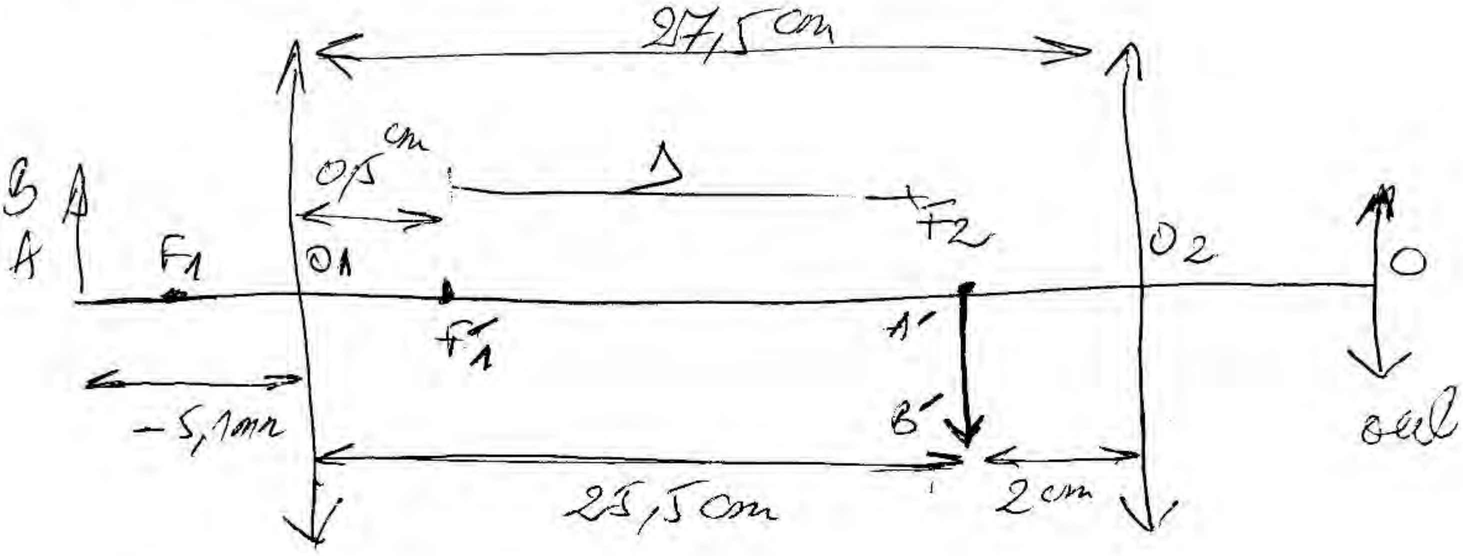
$\rightarrow R_1 = 162\,mm$

$R_2 > 0$

$R_2 = 15\,mm.$

47/ $C_{ob} = 200\ \delta$ $\overline{O_1F_1'} = \frac{1}{200}$ $\overline{O_1F_1'} = 5\ mm$ I

O $\overline{O_2F_2'} = 2cm$



$P = \Delta \cdot C_{ob} \cdot C_{oc}$

4° 8° à l'infini

$$\frac{1}{\overline{O_1A'}} - \frac{1}{\overline{O_1A}} = \frac{1}{\overline{O_1F_1'}}$$

$$\frac{1}{\overline{O_1A'}} = \frac{1}{\overline{O_1F_1'}} + \frac{1}{\overline{O_1A}}$$

$$\frac{1}{\overline{O_1A'}} = \frac{1}{5} + \frac{1}{-5,1} \longrightarrow \overline{O_1A'} = 255\ mm$$

$\Delta = 255 - 5$ $(\Delta = \overline{O_1F_2} - \overline{O_1F_1'})$ $\Delta = 250\ mm$

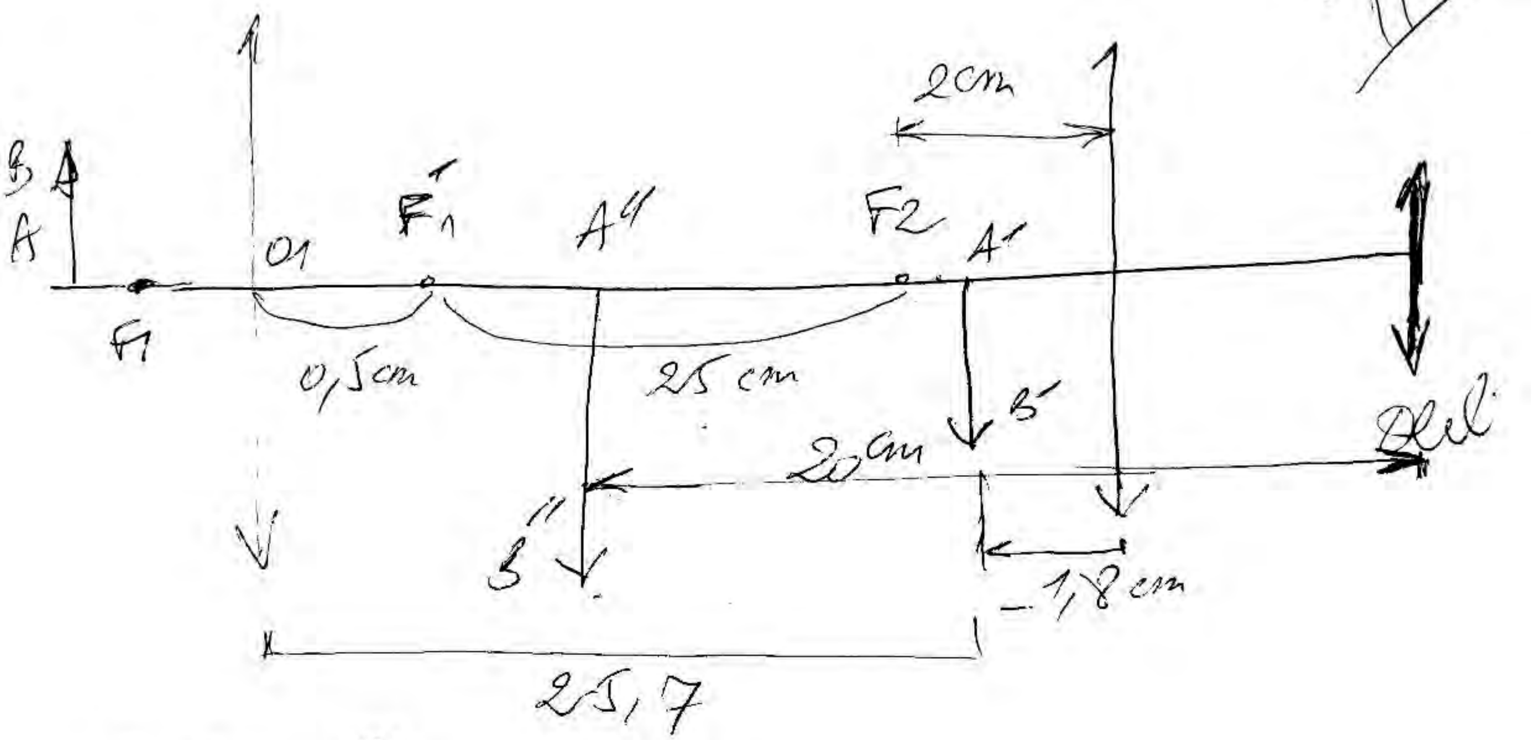
$C_{oc} = \frac{1}{\overline{O_2F_2'}}$ $C_{oc} = \frac{1}{2 \cdot 10^{-2}}$ $C_{oc} = 50\ \delta$

$P = \Delta \cdot C_{ob} \cdot C_{oc}$ $P = 250 \cdot 10^{-3} \cdot 200 \cdot 50$ $P = 2500\ \delta$

13

48

II



$$A'B' \xrightarrow[O_2F'_2]{O_2} A''B''$$

$$\frac{1}{O_2F'_2} = \frac{1}{O_2A''} - \frac{1}{O_2A'} \longrightarrow \frac{1}{O_2A'} = \frac{1}{O_2A''} - \frac{1}{O_2F'_2}$$

$$\frac{1}{O_2A'} = \frac{1}{-18} - \frac{1}{2} \qquad O_2A' = -1,8\,cm$$

$$\rightarrow O_1A' = O_1O_2 - O_2A' = 27,5 - 1,8$$

$$AB \xrightarrow[O_1F'_1]{O_1} A'B'$$

$$\frac{1}{O_1A'} - \frac{1}{O_1A} = \frac{1}{O_1F'_1} \rightarrow \frac{1}{O_1A} = \frac{1}{O_1A'} - \frac{1}{O_1F'_1}$$

$$\frac{1}{O_1A} = \frac{1}{25,7} - \frac{1}{0,5} \rightarrow O_1A = -0,509921\,cm$$

) Suite 48

$d = |O_1A'|_{PR} - |O_1A'|_{RR}$

$d = |15{,}1| - |15{,}09921|$ $d = 0{,}00079\ mm$

$d = 0{,}79\ \mu m$

49/ Accommodation max. $4'' 13''$ au RR

$G = P.|O RR|$

$P = |\gamma ob| . P_{oc}$ $\gamma ob = \frac{O_1A'}{O_1A}$ $\gamma ob = \frac{25{,}7}{-0{,}5099}$

$\gamma ob = -50{,}4$

$P_{oc} = C_{oc}\left[1 - \frac{a}{x}\right]$ $a = 0$ $P_{oc} = C_{oc} = 50\delta$

$P = |-50{,}4| \times 50 \rightarrow P = 2520\ \delta$

$G = 2520 \times |0{,}2|$ $G = 504$.

50/ $G_c = A . C_{ob} . C_{oe}/4$

$G_c = \frac{0{,}25 \times 200 \times 50}{4} \rightarrow G_c = \frac{2500}{4}$

$G_c = 625$

51/ $P = \frac{\varepsilon}{|AB|_{mi}} \longrightarrow |AB|_{mi} = \frac{\varepsilon}{P}$

$|AB|_{mi} = \frac{3\,10^{-4}}{2520}$ $|AB|_{mi} = 1{,}19\ 10^{-7}\ m$

J2/ $OPR \equiv -\infty$ $\quad OPP = -40\,cm$

$$A = \frac{1}{OPR} - \frac{1}{OPP} \quad A = \frac{1}{\infty} - \frac{1}{-0{,}4} \quad A = 2{,}5\ \delta$$

J3/ $C_{max} = ?$ $\quad C_{max} = \frac{1}{OT} - \frac{1}{OPP}$

$$C_{max} = \frac{1}{17 \cdot 10^{-3}} - \frac{1}{-0{,}4} \quad C_{max} = 61{,}32\ \delta$$

J4/ ~~myope~~ $OPP = -5m \rightarrow$ Presbyte

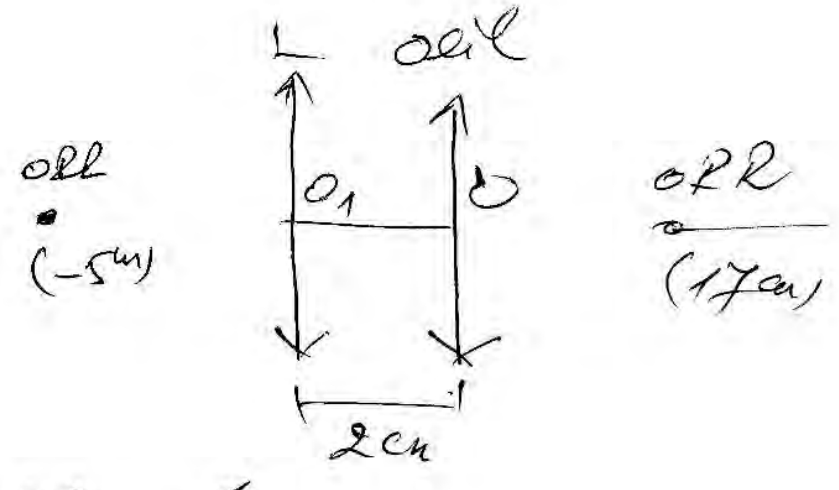
J5/ $A = \frac{1}{OPR} - \frac{1}{OPP}$

la Puissance de l'amétropie est $P = \frac{1}{OPR}$

$$\frac{1}{OPR} = A + \frac{1}{OPP} = P \rightarrow P = 6 + \frac{1}{-5} \quad P = 5{,}88$$

J6/

$$C = \frac{1}{O_1PR} - \frac{1}{O_1PR_c}$$



$O_1PR_c \equiv \infty$

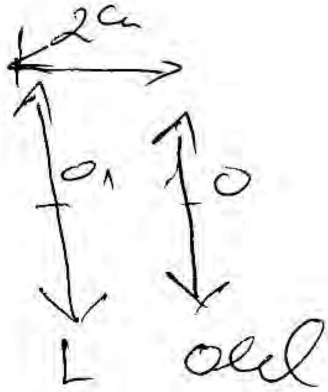
or $P = \frac{1}{OPR} \rightarrow OPR = \frac{1}{P}$

$OPR = 0{,}17\,m \rightarrow O_1PR = 19\,cm$

$$C = \frac{1}{O_1PR} \quad C = \frac{1}{0{,}19} \quad C = 5{,}2\ \delta$$

I7/ $C = \frac{1}{O_1PP} - \frac{1}{O_1PR_c} \to \frac{1}{O_1PR_c} = \frac{1}{O_1PP} - C$

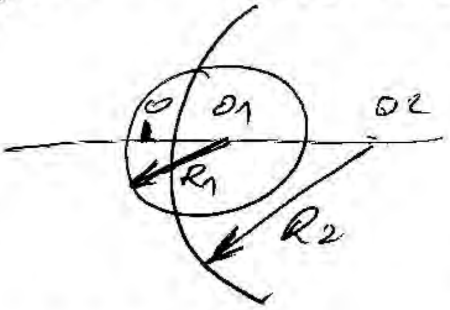
$\frac{1}{O_1PR_c} = \frac{1}{(-4,98)} - 5,2$



$O_1PR_c = (-0,185)$

$\to OPR_c = -20,5\,cm.$

I8/ oeil sur F' $\to a = 0$



$R_1 > 0$ $R_2 > 0$

avec $R_2 > R_1$

$\to R_2 = 4\,cm$

$OPP = -15\,cm$

$OPR = -50\,cm$

$C = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ avec $P = C\left(1 - \frac{a}{d}\right) = C$

$P = C = 12,5\,\delta$

$\frac{1}{R_1} = \frac{C}{\left(\frac{n}{n_0} - 1\right)} + \frac{1}{R_2} \to R_1 = 0,02\,m$

$R_1 = 2\,cm.$

I9) $d = (O_1F')^2 \left[\frac{1}{OPR + a} - \frac{1}{OPP + a}\right]$

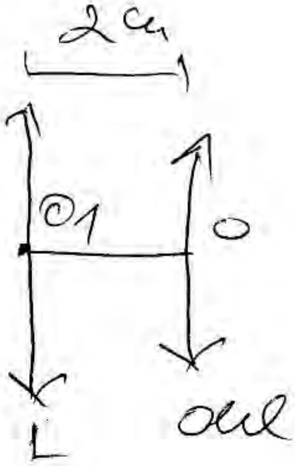
$O_1F' = \frac{1}{C} = \frac{1}{12,5} \to O_1F' = 0,08\,m$

$\to d = 2,98\,cm$

60/ $G = P \times fo PP1$

$G = 12{,}5 \times /0{,}15 /$ $G = 1{,}87$

61/



oPR oPP

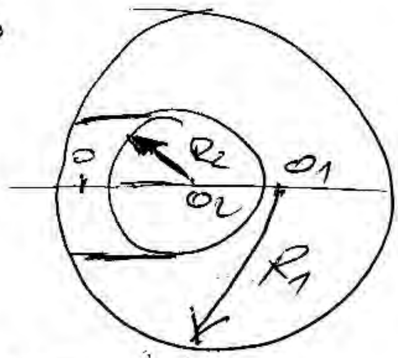
(−50cm) (−15cm)

$C = \frac{1}{O_1PR} - \frac{1}{O_1PRC}$ $O_1PRC \equiv -\infty$

$C = \frac{1}{O_1PR}$ $C = \frac{1}{-0{,}48}$ $C = -2{,}08$

62/

$C = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ $R_1 > 0$ $R_2 > 0$ avec $R_1 > R_2$



$\frac{C}{\frac{n}{n_0} - 1} = \frac{1}{R_1} - \frac{1}{R_2}$

$\frac{2{,}08}{\frac{1{,}52}{1} - 1} = \frac{1}{R_1} - \frac{1}{R_2}$ $\frac{1}{R_1} - \frac{1}{R_2} = 4$

63/ $C' = \frac{1}{OPR} - \frac{1}{OPR_c}$ $OPR_c \equiv -\infty$

~~OPR~~ →

$C' = \frac{1}{-0{,}5}$ $C' = -2$

$C' < C = -2{,}08$ → donc converge ↘

64/ Presbyte → σ

65/ $C_{ob} = 100\,\delta$ $C_{oc} = 20\,\delta$ $O_1O_2 = 16\,cm$

$O_1F'_1 = 1\,cm$. $\Delta = O_1O_2 - (O_1F'_1) - (O_2F'_2)$ $\Delta = 10\,cm$

$G_c = \frac{P_i}{4}$ $G_c = \frac{\Delta . C_{ob} . C_{oc}}{4}$ $G_c = \frac{0,1\ 100\ 20}{4}$ $G_c = 50$

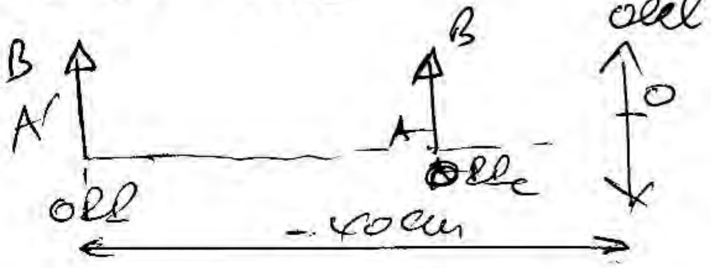
66/ $P_i = \Delta\, C_{ob}.\, C_{oc}$ $P_i = 200\,\delta$

67/ $P = \frac{\alpha'}{|AB|} \rightarrow \alpha' = P \times |AB|$ $P = P_i$ car vision sans accommodation

$\alpha' = 200 . 22\ 10^{-6} \rightarrow \alpha' = 44\ 10^{-4}$ rad

68/ $C = \frac{1}{OPR} - \frac{1}{OPR_c}$

$\rightarrow C = -2,5\,\delta$



69/ $OA < 0$ car objet réel $OA = -1\,cm$.

$OA' < 0$ car image virtuelle

Image 2 fois plus petite $\rightarrow |A'B'| = \frac{|AB|}{2} \rightarrow |\gamma| = \frac{1}{2}$

$\gamma = \frac{OA'}{OA}$ $\gamma > 0 \rightarrow \gamma = +\frac{1}{2}$ $OA' = \gamma . OA$

$OA' = \frac{1}{2}(-1) \rightarrow OA' = -0,5\,m$.

$\frac{1}{OF'} = \frac{1}{OA'} - \frac{1}{OA}$

$\frac{1}{OF'} = \frac{1}{-0,5} - \frac{1}{-1} \longrightarrow OF' = -1\,m$

$C = \frac{1}{OF'}$ $C = -1\,\delta$

70/ $A = \frac{1}{OPR} - \frac{1}{OPP}$ $C = \frac{1}{OPR} - \frac{1}{OPR_c}$ $OPR = -1\,m$

$A = \frac{1}{-1} - \frac{1}{-0,4} \longrightarrow A = 1,5$

71/ Myope car $\overline{OPP} = -0{,}4\,m$
+ presbyte

72/ $C = \dfrac{1}{\overline{OPP}} - \dfrac{1}{\overline{OPP_c}} \longrightarrow \dfrac{1}{\overline{OPP_c}} = \dfrac{1}{\overline{OPP}} - C$

$\overline{OPP} = -66{,}67\,cm$. $d = 66{,}67\,cm$

73/ $C_{ob} = 50\,\delta$ $C_{oc} = 20\,\delta$

$\overline{O_1F'_1} = 2\,cm$ $\overline{O_2F'_2} = 5\,cm$ $\overline{O_1O_2} = 25\,cm$

$\Delta = 18\,cm$.

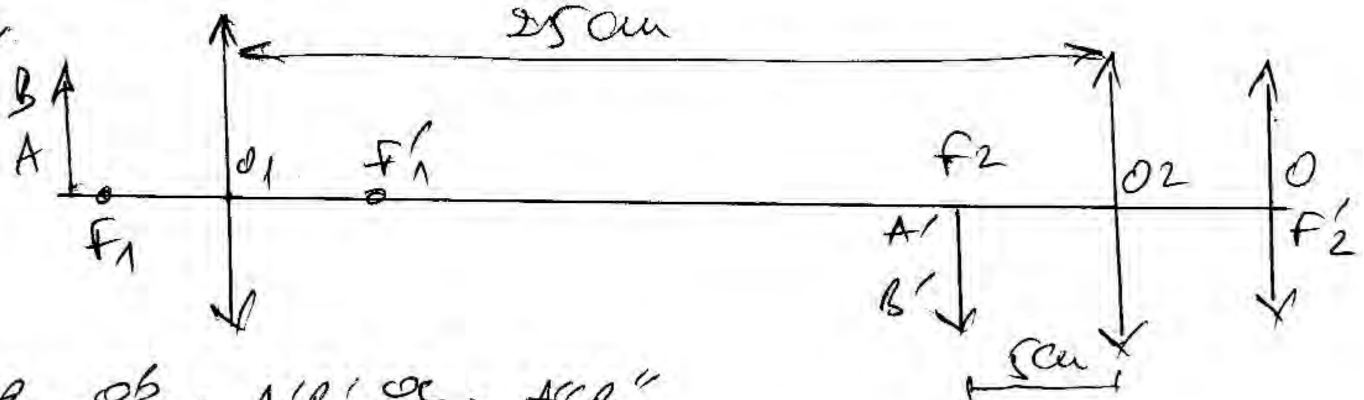
$G = P \times |\overline{OPP}|$

mise au point à l'infini $\longrightarrow P = P_i = \Delta\,C_{ob}\,C_{oc}$

$P = 0{,}18 \cdot 50 \cdot 20$ $P = 180\,\delta$

$G = |0{,}666| \cdot 180$ $G = 120$

74/



$AB \xrightarrow{ob} A'B' \xrightarrow{oc} A''B''$
$\quad\quad\quad\ \ \downarrow \quad\quad\quad\quad \infty$
$\quad\quad\ \ \text{sur } F_2$

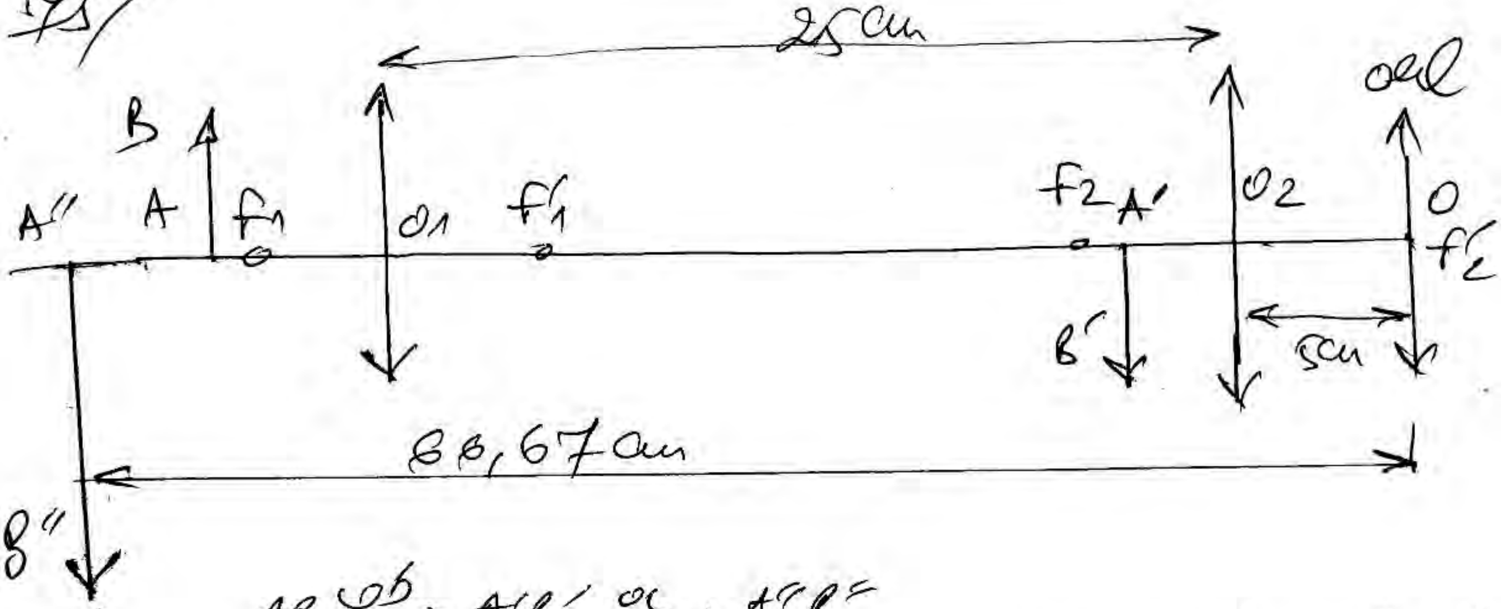
$A''B''$ à l'infini $\longrightarrow A'B'$ sur F_2

$AB \xrightarrow{ob} A'B'$

$A \xrightarrow[\overline{O_1F'_1}]{O_1} A'$ $\dfrac{1}{\overline{O_1A'}} - \dfrac{1}{\overline{O_1A}} = \dfrac{1}{\overline{O_1F'_1}}$

$\dfrac{1}{\overline{O_1A}} = \dfrac{1}{\overline{O_1A'}} - \dfrac{1}{\overline{O_1F'_1}}$ $\dfrac{1}{\overline{O_1A}} = \dfrac{1}{20} - \dfrac{1}{2} \rightarrow \overline{O_1A} = -2{,}2222$

75/



PP

$$AB \xrightarrow{ob} A'B' \xrightarrow{oc} A''B''$$

$$A' \xrightarrow[O_2F'_2]{O_2} A'' \qquad \frac{1}{O_2A''} - \frac{1}{O_2A'} = \frac{1}{O_2F'_2} \rightarrow \frac{1}{O_2A'} = \frac{1}{O_2A''} - \frac{1}{O_2F'_2}$$

$$\frac{1}{O_2A'} = \frac{1}{-61{,}67} - \frac{1}{5} \longrightarrow O_2A' = -4{,}625 \text{ cm}$$

$$O_1A' = 25 - 4{,}625 = 20{,}375$$

$$AB \longrightarrow A'B'$$

$$A \xrightarrow[O_1F'_1]{O_1} A' \qquad \frac{1}{O_1A'} - \frac{1}{O_1A} = \frac{1}{O_1F'_1} \rightarrow \frac{1}{O_1A} = \frac{1}{O_1A'} - \frac{1}{O_1F'_1}$$

$$\frac{1}{O_1A} = \frac{1}{20{,}375} - \frac{1}{2} \longrightarrow O_1A = -2{,}21717 \text{ cm}$$

$$L = |O_1A|_{PR} - |O_1A|_{PP} \qquad L = |-2{,}2222| - |-2{,}2171|$$

$$L = 0{,}004413 \text{ cm} = 44\;10^{-4} \text{ cm}$$

76/ $P = \dfrac{\varepsilon}{|AB|_{min}}$

$$|AB|_{min} = \frac{\varepsilon}{P} \qquad P = |\gamma_{ob}| \cdot P_{oc}$$

$$\gamma_{ob} = \frac{20{,}375}{-2{,}217} = -9{,}18 \qquad P = 9{,}18 \cdot 20 \qquad P = 183{,}768$$

$$|AB|_{min} = \frac{4\;10^{-4}}{183{,}76} \qquad |AB|_{min} = 21{,}77\;10^{-6} \text{ m}$$

77/ $A = \frac{1}{OPR} - \frac{1}{OPP}$ ou bien $A = \frac{1}{OPR_C} - \frac{1}{OPP_C}$

$OPR_C \equiv -\infty \rightarrow A = -\frac{1}{OPP_C} \rightarrow OPP_C = -\frac{1}{A}$

$\rightarrow OPP_C = -23,8$ cm $\rightarrow d = 23,8$ cm

78/ $C_{max} = 62,5\ \delta$

$C_{max} = \frac{1}{OT} - \frac{1}{OPR} \rightarrow \frac{1}{OPR} = \frac{1}{OT} - C_{max}$

$\frac{1}{OPR} = \frac{1}{17\ 10^{-3}} - 62,5 \rightarrow OPR = -27,2$ cm

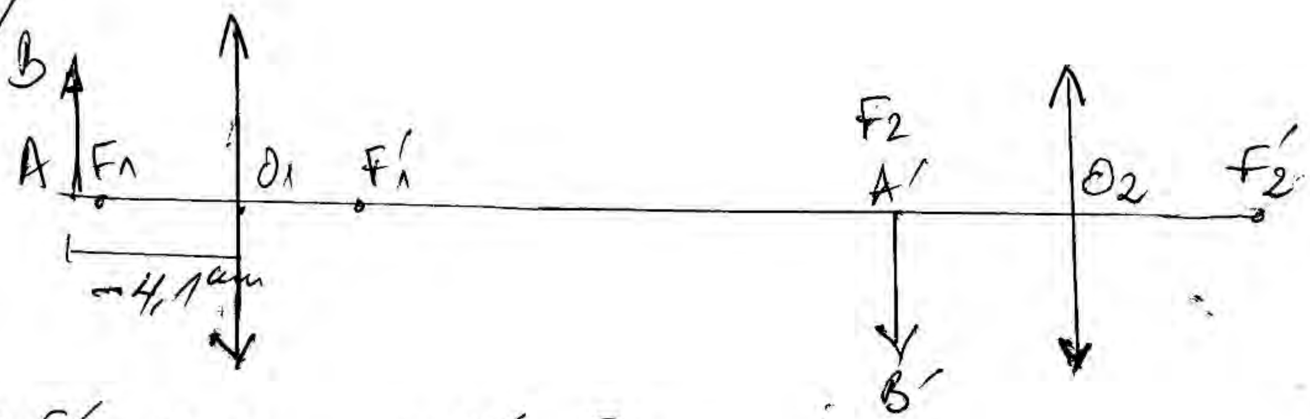
79/ $A = \frac{1}{OPR} - \frac{1}{OPP} \rightarrow \frac{1}{OPP} = \frac{1}{OPR} - A$

$\frac{1}{OPP} = \frac{1}{-27,2\ 10^{-2}} - 4,2 \rightarrow OPP = -0,127$ m

$OPP = -12,7$ cm.

80/ $C = \frac{1}{OPR} - \cancel{\frac{1}{OPR_C}}^{0}$ $C = \frac{1}{OPR}$ $C = -3,6\ \delta$

81/



$O_1F_1' = 4$ mm $O_2F_2' = ?$

$O_1O_2 = 184$ mm.

Suite 81

La Puissance de l'oculaire est égale à la Puissance intrinsèque $\longrightarrow P_i = P_{oc} = C_{oc}\left(1 - \frac{a}{d}\right)$

Comme ~~...~~ $P_i = C_{oc}$

$P_{oc} = C_{oc} = \frac{1}{O_2F_2'}$

Comme $P_{oc} = P_i$, donc l'image A'B' est sur F_2'

on cherche sa position par rapport à O_1.

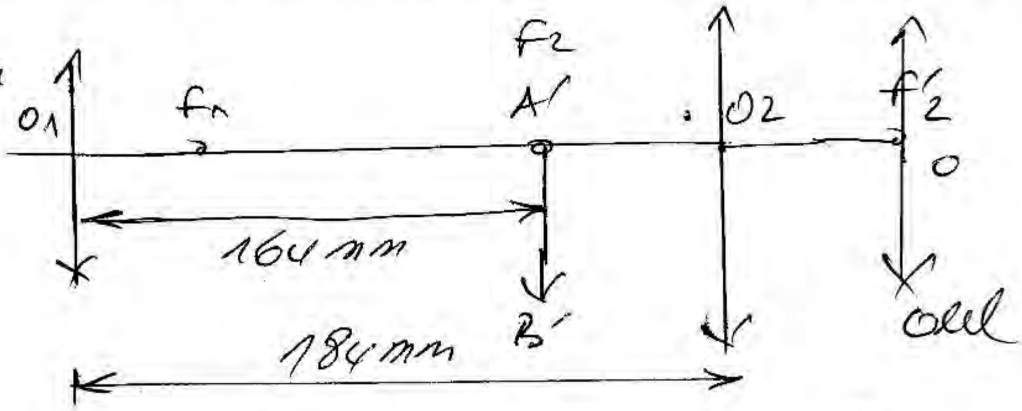
$AB \xrightarrow{\text{cob}} A'B'$

$A \xrightarrow[O_1F_1']{O_1} A'$ $\qquad \frac{1}{O_1A'} - \frac{1}{O_1A} = \frac{1}{O_1F_1'}$

$\frac{1}{O_1A'} = \frac{1}{O_1F_1'} + \frac{1}{O_1A} \longrightarrow \frac{1}{O_1A'} = \frac{1}{4} + \frac{1}{-4{,}1}$

$\rightarrow O_1A = 164\,mm \longrightarrow |O_2F_2| = 184 - 164 \quad |O_2F_2| = 20\,mm$

$\rightarrow O_2F_2' = +20\,mm$



$P_{oc} = \frac{1}{O_2F_2} \qquad P_{oc} = \frac{1}{20\ 10^{-3}} \qquad$ ~~P_{oc} ...~~ $P_{oc} = 50\delta$

82/ vision sans accommodation + oeil emmétrope donc l'image finale A''B'' est à l'infini.

$\rightarrow P = P_i = \Delta \cdot C_{ob} \cdot C_{oc} \qquad \Delta = O_1O_2 - O_1F_1' - O_2F_2'$

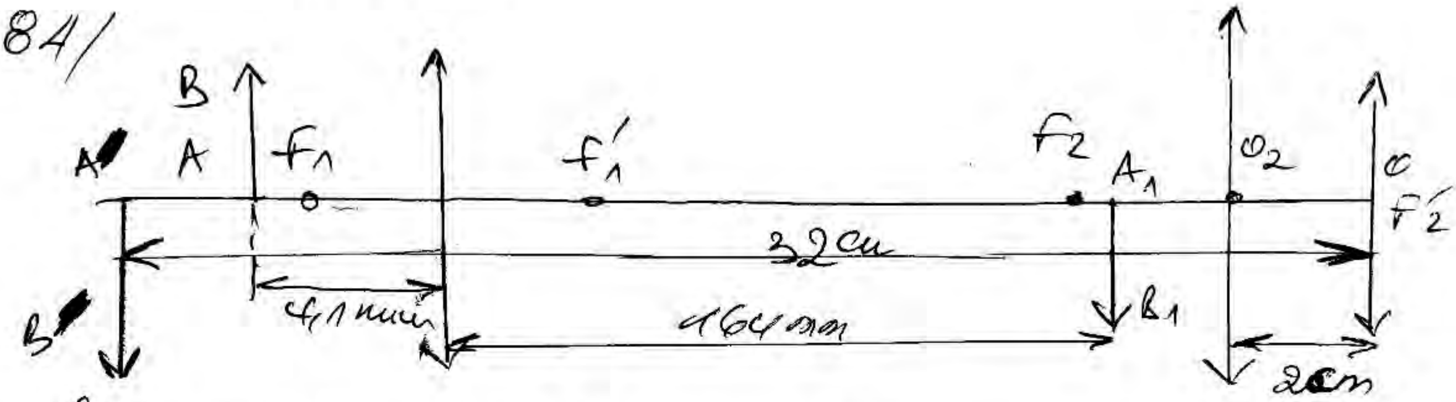
$\Delta = 184 - 4 - 20$

$P = 0{,}16 \times \frac{1}{0{,}004} \times \frac{1}{0{,}02} \quad P = 2000\delta \qquad \Delta = 160\,mm$

83/ L'image finale étant toujours à l'infini (vision sans accommodation) $\rightarrow P = P_i$.

$P = 2000\ \delta$

84/



L'image finale A'B' doit être rapprocher donc l'image intermédiaire A_1B_1 doit être après F_2 par suite il faut rapprocher l'oculaire de l'objectif.

85/ Il faut chercher la position de A_1B_1 par rapport à O_2

$$AB \xrightarrow{ob} A_1B_1 \xrightarrow{oc} A'B'$$
(OPP)

$$A_1B_1 \xrightarrow{Ob} A'B'$$

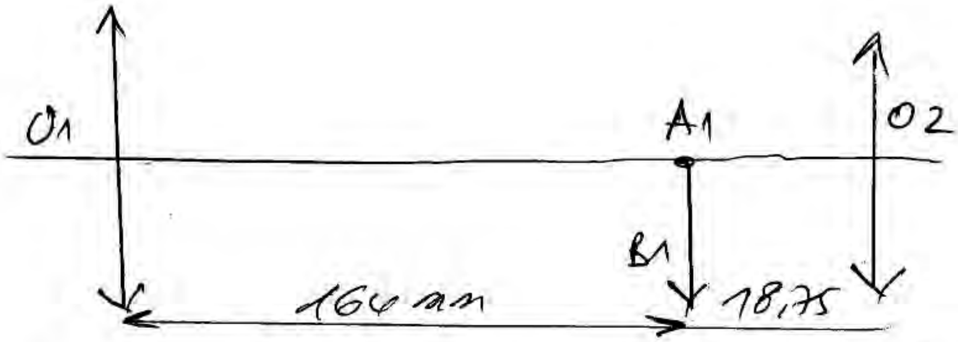
$$A_1 \xrightarrow[O_2F_2']{O_2} A' \qquad \frac{1}{O_2A'} - \frac{1}{O_2A_1} = \frac{1}{O_2F_2'}$$

$$\frac{1}{O_2A_1} = \frac{1}{O_2A'} - \frac{1}{O_2F_2'} \rightarrow \frac{1}{O_2A_1} = \frac{1}{-30} - \frac{1}{2}$$

$O_2A_1 = -1,875\text{ cm} \qquad O_2A_1 = -18,75\text{ mm}.$

24

suite 85



la nouvelle distance qui sépare l'objectif de l'oculaire est $(O_1O_2)' = 164 + 18,75$

$(O_1O_2)' = 182,75$

déplacement $= (O_1O_2) - (O_1O_2)'$

$d = 184 - 182,75 \quad d = 1,25$ mm

ou bien pour une Image au RR l'image A_1B_1 était à 20mm, pour une Image au PR elle est à 18,75 donc le déplacement est

$d = 20 - 18,75$

$d = 1,25$ mm.

86/ $P = \gamma_{ob} \cdot P_{oc}$

$\gamma_{ob} = \frac{O_1A_1}{O_1A} \quad \gamma_{ob} = \frac{164}{-4,1} \quad \gamma_{ob} = -40$

$P_{oc} = C_{oc}\left[1 - \frac{a}{d}\right]$ oeil sur $F_2' \rightarrow P_{oc} = C_{oc} = 50\delta$

$P = |-40| \times 50 \quad P = 2000\ \delta$

87/ $G = P \times |\overline{oPR}|$

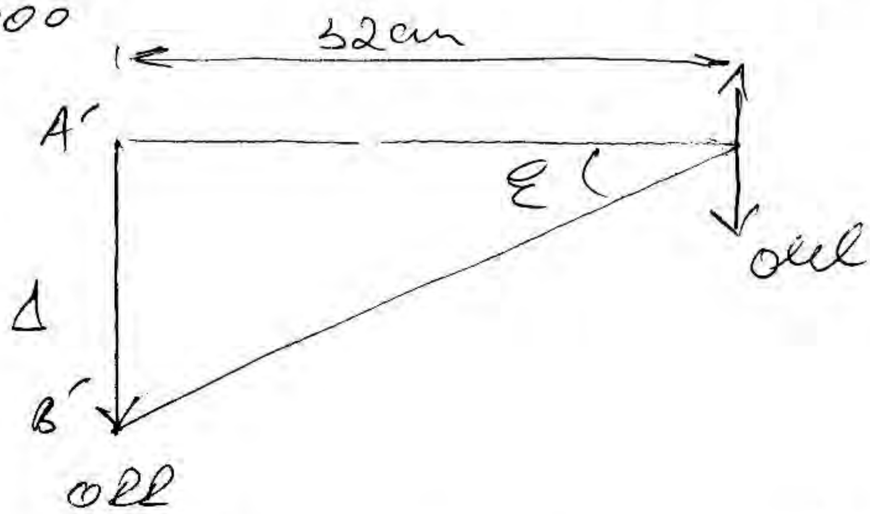
$G = 2000 \cdot |0,32| \quad G = 640$

25

88/ $\rho = \dfrac{\mathcal{E}}{|AB|_{oeil}} \longrightarrow |AB|_{oeil} = \dfrac{\mathcal{E}}{\rho}$

$|AB|_{oeil} = \dfrac{4\ 10^{-3}}{2000}$ $|AB|_{oeil} = 2\ 10^{-6}m$ $|AB| = 2\mu m$

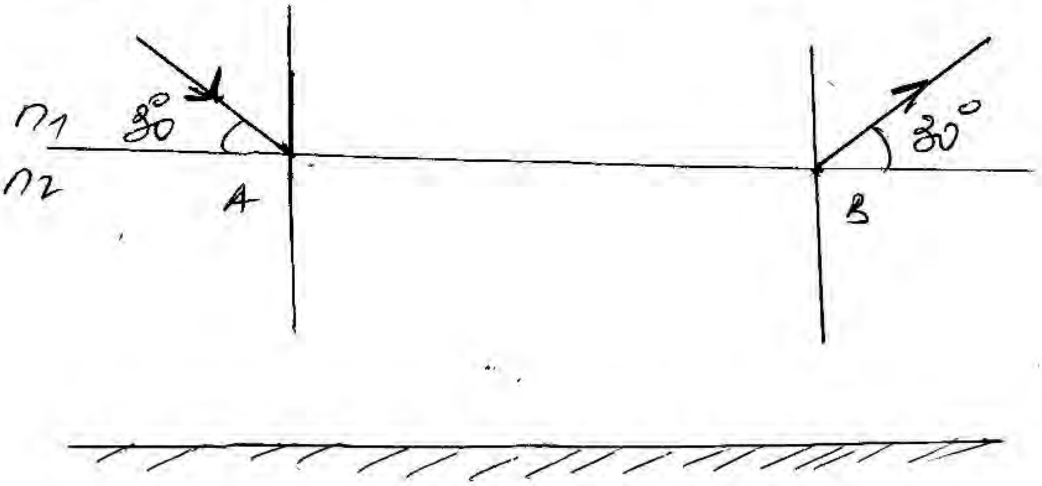
89/



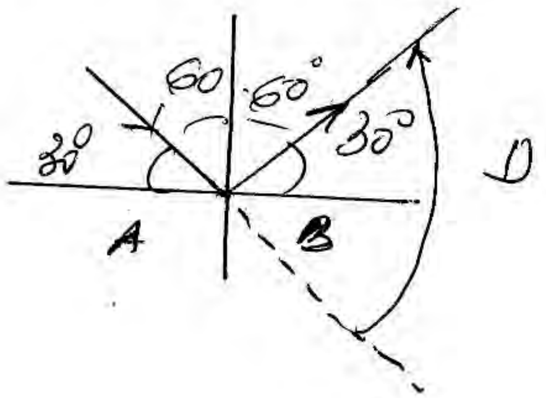
$\mathcal{E} = \dfrac{\Delta}{oeil} \longrightarrow \Delta = \mathcal{E} \cdot oeil$ $\Delta = 4\ 10^{-3} \cdot 32\ 10^{-2}$

$\Delta = 128\ 10^{-5}m$ $\Delta = 128\ 10^{-2}mm$ $\Delta = 1{,}28\ mm.$

90/



Methode directe



$D_T = 180 - 2 \times 60$

$D_T = 60°$

26

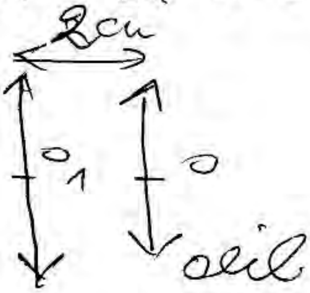
Q1/ $\overline{OPR} = 1{,}5\ m \quad A = 4\ \delta$

$$A = \frac{1}{\overline{OPR}} - \frac{1}{\overline{OPP}} \longrightarrow \frac{1}{\overline{OPP}} = \frac{1}{\overline{OPR}} - A$$

$$\frac{1}{\overline{OPP}} = \frac{1}{1{,}5} - 4 \qquad \overline{OPP} = -0{,}30\ m$$

$\overline{OPP} =$ 30 cm en avant de l'oeil

Q2/ $$C = \frac{1}{\overline{OPR}} - \frac{1}{\overline{OPR_c}} \qquad \overline{OPR_c} = \infty$$



$$C = \frac{1}{1{,}5} \longrightarrow C = 0{,}67\ \delta$$

$$C = \frac{1}{\overline{OPP}} - \frac{1}{\overline{OPP_c}} \longrightarrow \frac{1}{\overline{OPP_c}} = \frac{1}{\overline{OPP}} - C$$

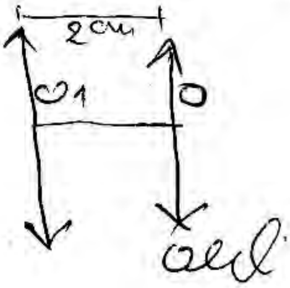
$$\frac{1}{\overline{OPP_c}} = \frac{1}{-0{,}30} - 0{,}67 \longrightarrow \overline{OPP_c} = -0{,}25\ m$$

$]-\infty, -25\,cm]$

Q3/ $$C = \frac{1}{\overline{O_1PR}} - \frac{1}{\overline{O_1PR_c}} \qquad \overline{O_1PR_c} = -\infty$$

$$C = \frac{1}{\overline{O_1PR}}$$

$\overline{OPP}$ (−30 cm)



$\overline{OPR}$ (1,5m)

$$C = \frac{1}{1{,}52} \qquad C = 0{,}658\ \delta$$

$$C = \frac{1}{\overline{O_1PP}} - \frac{1}{\overline{O_1PP_c}} \longrightarrow \frac{1}{\overline{O_1PP_c}} = \frac{1}{\overline{O_1PP}} - C$$

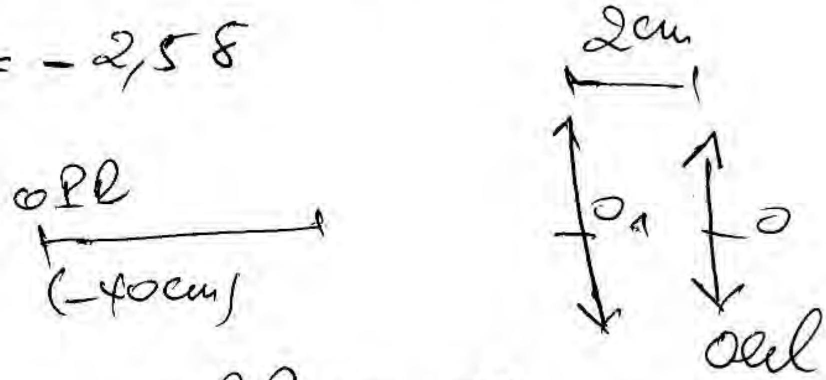
$$\frac{1}{\overline{O_1PP_c}} = \frac{1}{-0{,}28} - 0{,}658 \qquad \overline{O_1PP_c} = -23{,}64\ cm$$

$]-\infty, -23{,}64]$

94/ $\Rightarrow OPR = -40cm \rightarrow$ Myope

95/ $P = \frac{1}{OPR}$ $P = -2,5\,\delta$

96/



$C = \frac{1}{O_1PR} - \frac{1}{O_1PR_c}$ $O_1PR_c \equiv -\infty$

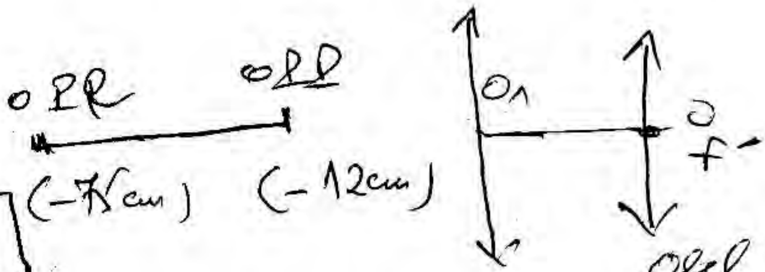
$C = \frac{1}{O_1PR}$ $C = \frac{1}{-38\,10^{-2}}$ $C = -2,63\,\delta$

97/ $C' = \frac{1}{OPR} - \frac{1}{OPR_c}$ $OPR_c \equiv -\infty$

$C' = \frac{1}{OPR}$ $C' = \frac{1}{-0,4}$ $C' = -2,5\,\delta$

donc ⊘ la verfence ↘

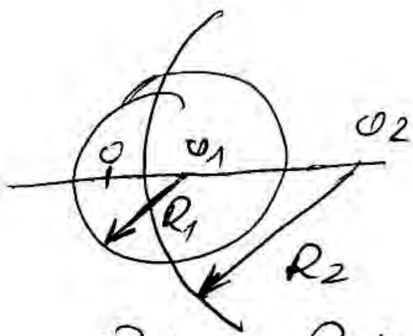
98/ $a = 0$



$d = (O_1F')^2 \left[\frac{1}{OPR+a} - \frac{1}{OPP+a}\right]$

$C = \frac{1}{O_1F'} = \left(\frac{n}{n_0} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$\rightarrow C = 10\,\delta \rightarrow O_1F' = 0,1m$



$d = (0,1)^2 \left[\frac{1}{-0,75+0} - \frac{1}{-0,15+0}\right]$

$R_1 > 0$ $R_2 > 0$

$R_2 > R_1$

$d = 0,07\,m$ $d = 7\,cm$

$R_1 = 2,5cm$
$R_2 = 5cm$

99/ $P = c\left(1 - \frac{a}{d}\right)$ $a = 0$ $P = C = 108$

100/ $G = P \times |0_{PP}|$ $G = 10 \times 0{,}12$

$G = 1{,}2$

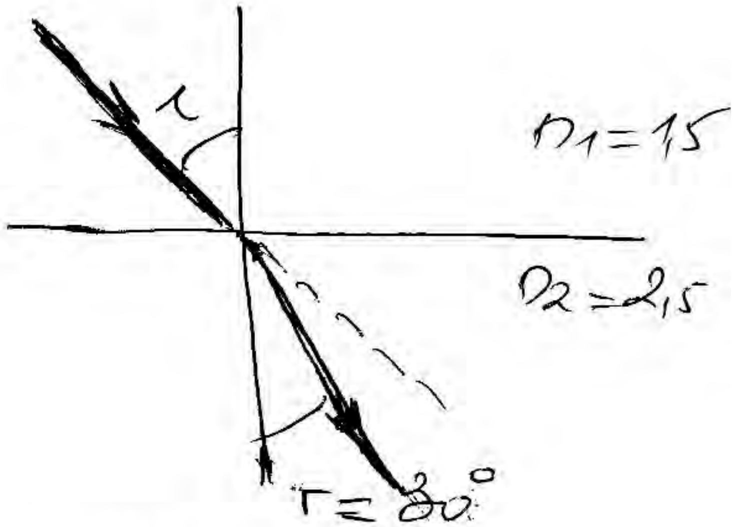
101/ $G' = P \times |0_{PP}|$

$G' = 10 \times 0{,}25$ $G' = 2{,}5$

grossissement plus important

102/

réfracté + réfléchi



103/ OA réel $\rightarrow$ $OA = -15$ cm

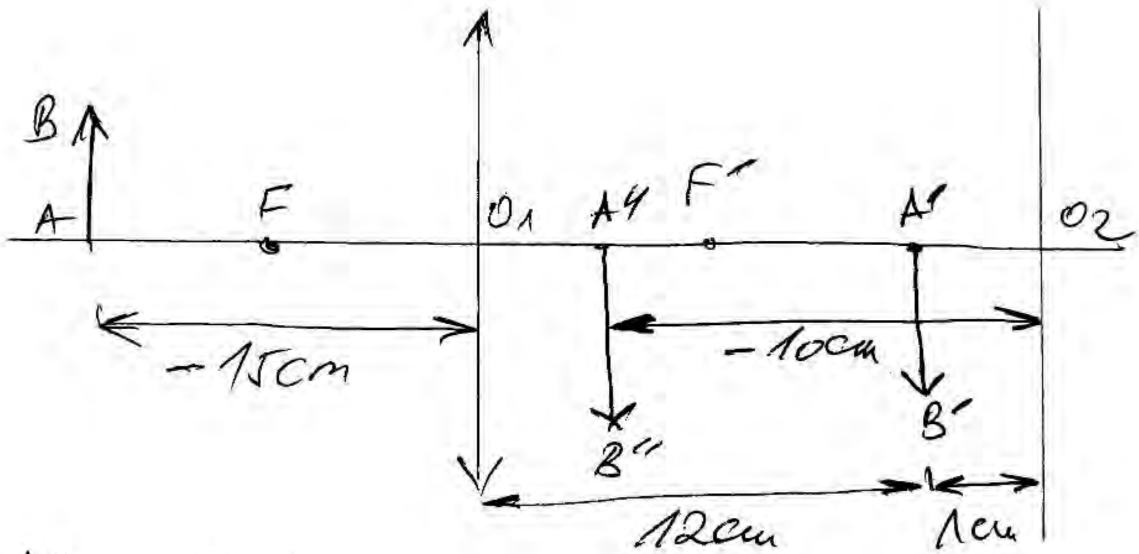
OA' réelle $\longrightarrow$ $OA' > 0$ $OA' = 12$ cm

$\frac{1}{OF'} = \frac{1}{OA'} - \frac{1}{OA}$ $\longrightarrow$ $\frac{1}{OF'} = \frac{1}{12} - \frac{1}{-15}$

$OF' = 6{,}67$ cm.

104/ $\gamma = \frac{OA'}{OA}$ $\gamma = \frac{12}{-15}$ $\gamma = -0{,}8$

105/



$A'B' \xrightarrow{L2} A''B''$

$A''B''$ droite $\longrightarrow \gamma > 0 \longrightarrow O_2A'' < 0$

$|A''B''| = 4cm$. $\quad O_2A' = -1cm$

$O_2A'' = -10cm$.

$A' \xrightarrow[O_2F'_2]{O_2} A''$

$$\frac{1}{O_2F'_2} = \frac{1}{O_2A''} - \frac{1}{O_2A'} \longrightarrow \frac{1}{O_2F'_2} = \frac{1}{-10} - \frac{1}{-1}$$

$\longrightarrow O_2F'_2 = 1,11\ cm$.

106/ $|\gamma_2| = \dfrac{|A''B''|}{|A'B'|} \longrightarrow |A'B'| = \dfrac{|A''B''|}{|\gamma_2|}$

$\gamma_2 = \dfrac{O_2A''}{O_2A'}$ $\quad \gamma_2 = \dfrac{-10}{-1}$ $\quad \gamma_2 = 10$ $\quad |A'B'| = \dfrac{4}{10}$

$|A'B'| = 0,4\ cm$

$|\gamma_1| = \dfrac{|A'B'|}{|AB|} \longrightarrow |AB| = \dfrac{|A'B'|}{|\gamma_1|}$

~~|A'B'|~~ $=$ $\longrightarrow |AB| = \dfrac{0,4}{0,8}$ $\quad |AB| = 0,5cm$

$d = 0,5\ cm$

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